DOCUMENT RESUME

ED 394 418 HE 029 112

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TITLE Undergraduates Learning from Nonnative English-Speaking Teaching Assistants.
PUB DATE Apr 96
NOTE 60p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, April 8-13, 1996).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Bilingual Teachers; Graduate Students; Higher Education; Instructional Effectiveness; *Intercultural Communication; *Learning Processes; *Teacher Effectiveness; Teacher Student Relationship; *Teaching Assistants; *Undergraduate Students
IDENTIFIERS Peer Mediation

ABSTRACT

This study investigates whether the Student Mediation Model is useful for understanding how undergraduates learn from international teaching assistants (ITAs) teachers who are not from the United States and are not native English-speakers. The study examines a sample of over 8,300 students enrolled in beginning and more advanced calculus and computer science courses. Student grades and instructor evaluations were quantitatively analyzed to compare student achievement and satisfaction with instruction in courses taught by native English-speaking teaching assistants (NTAs) in comparison to courses taught by ITAs. Results suggest that students taught by ITAs in more advanced classes adapt to the quality of instruction. Students' grades and evaluations of the teaching assistants are not significantly different across NTA and ITA sections. Conversely, students in beginning courses appear to lack sufficient readiness to negotiate meaning with ITAs, resulting in lower communication and overall ratings of ITAs compared to NTA ratings. Despite this, the beginning students are able to marshall their efforts in order to achieve on a par with students in NTA sections. It is asserted that university administrators should try to avoid assigning ITAs to beginning courses, assigning them to more advanced classes instead. It is concluded that a Student Mediation Model may be better than an Information Transmission Model to explore how undergraduates learn from ITAs. (Contains 35 references.) (Author/NAV)

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ABSTRACT

Undergraduates learning from nonnative English-speaking teaching assistants

This study investigates whether the student mediation model is a useful framework for understanding how undergraduates learn from teachers who are not from the U.S., and are not native English-speakers. It examines a sample of over 8300 students enrolled in beginning and more advanced calculus and computer science courses. The distribution of student grades and instructor evaluations are quantitatively analyzed to compare student achievement and student satisfaction with instruction in courses taught by native English-speaking teaching assistants in comparison to courses taught by nonnative English-speaking teaching assistants.

The theoretical significance of this study is that it uses a model of learning that treats teaching effectiveness as a relational attribute as opposed to a teacher trait. The practical significance of this study is that large U.S. research universities are highly dependent on international instructors. Nevertheless, educational research has yet to analyze which types of learner readiness variables as well as administrative policies are conducive for optimizing undergraduate learning in intercultural contexts.

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Introduction

As we rely more and more on international graduate students to lead discussion sections, and labs in undergraduate courses in math, computer science, natural science, and engineering at U.S. universities, several questions are raised about the effects of learning in an intercultural context. At the large research university where this study was conducted, 33% of the teaching assistants are nonnative English-speakers from outside of the U.S. Moreover, in some departments such as math, and computer science, international teaching assistants (ITAs) comprise from 66% to 75% of the teaching assistants instructing undergraduates. The study reported here, invokes a learner-centered constructivist model to investigate the effects of learning calculus and computer science in an intercultural context. This study measures the effects on student achievement of being taught by ITAs as compared to being taught by native English-speaking teaching assistants (NTAs). Equally important, the students' evaluations of their ITAs and NTAs are analyzed to investigate student satisfaction with ITAs. By studying both achievement measures and student satisfaction measures, the study sheds light on the contexts where students perceive that they benefit from ITA instruction and also where the students perceive that they are less able to benefit from ITA instruction.

International Teaching Assistant Research

To date, the research investigating the effect of being taught by nonnative English-speaking teaching assistants (ITAs) has been

conducted using an information transmission model of learning (Briggs & Hofer, 1992; Jacobs & Friedman; Norris, 1991; Watts & Lynch, 1989). These researchers were trying to address the perceptions of undergraduates, their parents, faculty supervisors and legislators that ITAs were having a negative effect on student achievement (Barber & Morgan, 1988; Brown, 1988; Chang, 1995; Cresswell, 1990; Fox and Gay, 1994; Hartman, 1995; IIE, 1993; Paige, 1990; Secter, 1987).

Watts & Lynch (1989) found that undergraduates taught by ITAs in the economics department at Purdue scored significantly lower on standardized post-tests than those undergraduates taught by NTAs. Watts and Lynch also found that other variables were meaningful predictors of the students' post-test scores on the 30 item standardized economics test. These variables included the students' prior knowledge as measured by SAT math scores, pre-test scores on the 30 item standardized economics test, and the students' academic experience as measured by whether the students were freshman or more experienced upperclassmen.

Interestingly, within the same study, Watts & Lynch (1989) found that when one measured student performance in terms of their grades, then the effect of having an ITA on student achievement was not statistically significant. They explained that the reason there was no difference in the grade mean was because "instructors soon adopt a 'typical' distribution of grades" (p.238).

More recently, in Norris' (1991) study of the quality of instruction by ITAs and NTAs across five semesters at the University of Wisconsin in the humanities, mathematics, social sciences, and physical/biological sciences, he found that the mean grades of students in ITA sections were higher than the mean grades of NTA sections. He also found that regardless of the ITAs' region of origin, the ITAs' students achieved statistically significantly higher grades than the students in NTA sections. In response to the Watts & Lynch (1989) observation, about instructors adopting typical grade distributions, Norris only used class sections where the teaching assistants did not have primary responsibility for assigning grades to avoid this confounding variable.

Furthermore, Norris verified that the results were not confounded by a greater proportion of students dropping the ITA sections in comparison to the NTA sections. It had been hypothesized by both Watts & Lynch (1989) and Norris (1991) that the mean grade comparisons might have been affected by students who voted with their feet and dropped or transferred out of ITA sections thereby artificially inflating the mean GPA of ITA sections. However, in both studies, neither of the researchers found any evidence that students were more likely to drop or transfer out of ITA sections.

The shortcoming of both Watts & Lynch's (1989) and Norris' (1991) methodology is that they only used student achievement to measure ITA effectiveness. Both studies leave unanswered whether the students' achievement was related to their interaction with their ITAs.

This methodological oversight occurred because the authors were basing their studies on an information transmission model of learning. Both studies treated the students as passive recipients of information.

In contradistinction, Jacobs and Freidman's (1988) study of undergraduates taught by ITAs in math and computer science, considered both the students' grades and the students' evaluations of their ITAs' teaching effectiveness. They found that TA type was not a significant factor affecting the students' final examination scores. Yet, they did find that in the lower division math classes that the NTAs were evaluated significantly higher than the ITAs. They also found that significantly more students dropped the ITA sections of the basic math class than the NTA sections.

Conversely, in the one upper division math class and the computer science class, the ITAs were evaluated significantly higher than the NTAs. Albeit, these findings may only be applicable to their specific sample because only two ITAs were analyzed in the upper division math class and only four ITAs were analyzed in the computer science class.

Instead of concentrating on student variables to explain the difference in student satisfaction with ITAs and NTAs in beginning and more advanced classes, the authors once again focused on the information transmission skills of the ITAs despite their recognition that all of the ITAs' had passed an oral English proficiency test before being permitted to teach.

Further, Jacobs and Friedman's companion study compared instructor evaluations of a random sample of sections in different departments taught by NTAs and all sections taught by ITAs. These evaluations revealed that the NTAs' mean instructor rating was significantly higher than the ITAs' mean instructor rating on all items measuring the instructors' English language ability, and instructor effectiveness.

When Jacobs and Friedman discussed why their university-wide analysis found that the NTAs were evaluated more positively than the ITAs, they did not report whether these instructor evaluations were collected from introductory or advanced classes, or whether most ITAs taught basic courses while NTAs were assigned to more upper division courses. Instead, they concluded that those non-native English-speaking graduate "students with the best oral English proficiency scores be chosen as teaching associates" (p.563).

In sum, Jacobs and Friedman found no significant effect on students' final exam scores due to TA type. However, they invoked an information transmission model when they concluded that student satisfaction with their ITAs was based on the quality of their ITAs' oral English proficiency.

Similarly, in Briggs & Hofer's (1992) study at The University of Michigan, they used an information transmission model of learning to investigate undergraduate evaluations of ITAs and NTAs. They confirmed that by instituting oral proficiency testing and training of ITAs

that they could lessen the gap between higher NTA instructor evaluations in comparison to lower ITA instructor evaluations. Nonetheless, Briggs & Hofer did not hypothesize why this gap persisted.

Accented Speech Research

The experimental research about accented speech treats the listener as passive and unable to affect the quality of communication. These studies concentrate on undergraduates' perceptions, and evaluations of nonnative English-speaking teachers' speech.

Two separate models, the Negative Affect Mechanism model, and the Negative Stereotyping model have emerged from socioliguistic research to explain the negative affect and negative evaluations generated by accented speech. Sebastian and Ryan (1985) confirmed that when college undergraduates listened to tapes to be able to complete a task, speakers with an accent were negatively evaluated. In addition, the accented speech aroused negative affect among speakers of standard English.

Sebastian and Ryan ran a second experiment to determine whether the subjects were reacting to the difficulty that they were having in understanding the tape and completing the task, or if they were reacting to the different speech style. In the second experiment, the researchers used standard English-speakers, and inserted bursts of noise and static to make the information more difficult to hear. They found that in the noisy condition that undergraduates gave the standard English-speakers more negative evaluations and reported more

negative affect. Consequently, they proposed the Negative Affect Mechanism model. They suggested that the undergraduates' negative evaluations, and their negative affect were partially the result of the difficulty that listeners had in understanding the message. They concluded that the discomfort associated with the effort required to understand the speakers resulted in the downgrading of accented speakers.

In addition, Sebastian and Ryan suggested that negative stereotyping could have been partially responsible for the undergraduates negative evaluations of the accented speech. The social psychology of language attitudes was documented by Labov (1972) and Clair (1982). Clair explained that "standard English" is the only language variety that is legitimated by government for use in schools and in government. It is the dialect that is used in dictionaries and public media. Language standardization occurs because members of a nation recognize the dialect used by powerful discourse communities. The masses emulate these dialects in order to gain acceptance and status within the target culture. Meanwhile, those entrenched in the power structure protect their influence by discriminating against those who are both powerless and different.

Within the U.S. education system, around the turn of the century the psychometric movement established the power elite's dialect as "standard English". Psychologists such as Lewis Terman legitimated the use of this dialect on a long term basis by writing IQ and standardized

testing instruments in the standardized speech style of the power elite of the first quarter of this century (Clair, 1982, pp. 172-173). Interestingly, the social enforcers of "standard English" are teachers, psychometricians and school administrators. Social mobility is controlled by English proficiency tests. Non-standard dialects are deemed deviant, and those who adhere to these forms of speech are stigmatized.

These perceptual biases have been well documented in guise research (Brown, 1992; Chang, 1993; Rubin & Smith, 1990; Rubin, 1992). Guise studies are designed so that subjects believe that the person they are listening to possesses certain ethnic, speech, or physical characteristics. Rubin and Smith (1990) studied the reactions of undergraduates toward ITA speech. They concluded that "many factors other than low levels of communication competence may contribute to negative perceptions of ITAs. Some of these factors may be more germane to North American undergraduates' stereotypical attitudes than to ITAs' classroom talk" (1990, p. 337). In their study, 92 native English speaking undergraduates at the University of Georgia listened to tape recorded classroom lectures. They were shown a photograph of the female lecturer. The independent variables were whether the picture shown of the female speaker was Caucasian or Oriental (controlled for attractiveness). Second, the recordings were made by the same speaker reading a script with either a moderate or strong accent similar to the accentedness of typical ITAs. Third, the lecture topics were either

a humanities topic about an Indian classic tale, or a science topic about the scarcity of helium supplies.

The results revealed that the subjects' impressions of overall teaching ability were found to correlate only with the ITAs' perceived accentedness. The relationship was inverse (r=-.41). Moreover, no contrasts between high and low accented speech affected comprehension as measured by the subjects' scores on a cloze comprehension test. These findings were replicated by Chang(1993) who used videos of ITA oral performance tests. Despite the undergraduates' ability to comprehend the ITAs, they rated their teaching effectiveness inversely with perceived accentedness.

The design of the accented research guise experiments was based on an information transmission model of learning. The speaker recited information, and the listeners passively absorbed what they could. The research design focused only on how the speaker performed as opposed to how the listener constructed the meaning of the speaker's message. These experimental designs also disregard the listener's motivation to comprehend the speaker.

By stark contrast, within the domain of educational psychology, researchers have abandoned the information transmission model as a framework to understand student learning. Accordingly, the accented research findings are informative, but may not explain why students' grades are not significantly different when taught by ITAs or NTAs. Similarly, the accented speech research is not predictive for

understanding when ITAs' teaching effectiveness will be perceived on a par with NTA instruction.

The Student Mediation Model

A more comprehensive framework for understanding how students learn in an intercultural context is the proposed Student Mediation Model. The basic premise is that teaching affects achievement through student thought processes (Knight & Waxman, 1991; Meyer, 1993; Wittrock, 1986). It is the learner who voluntarily chooses to construct meaning and use the tools of the teacher to advance through his/her zone of proximal development (ZPD) (Vygotsky, 1978). The zone of proximal development is the distance between what the learner can do on his/her own, and what the learner can do with the aid of a more capable assistant. It is by internalizing the teacher's ways of thinking and adding them to the students' own ways of thinking that the student can move through his/her ZPD. Applying Rogoff's social construction model (1991), learners gather information actively and practice skills by voluntarily involving themselves with more skilled people.

Wittrock (1986) contrasted an information transmission model of learning with a model that recognized that students voluntarily mediate teacher input. He concluded that it was student thought processes that had a direct effect on learning and achievement whereas the teacher

had an indirect effect. Pursuant to a constructivist perspective (Cobb, 1993; Phillips,1995), student achievement, and his/her evaluation of his/her ITA might be better understood by considering the student's prior subject matter knowledge, self-regulation skills, self-efficacy beliefs, motivation, pre-existing attitude toward ITAs and the first language of the student and the student's family.

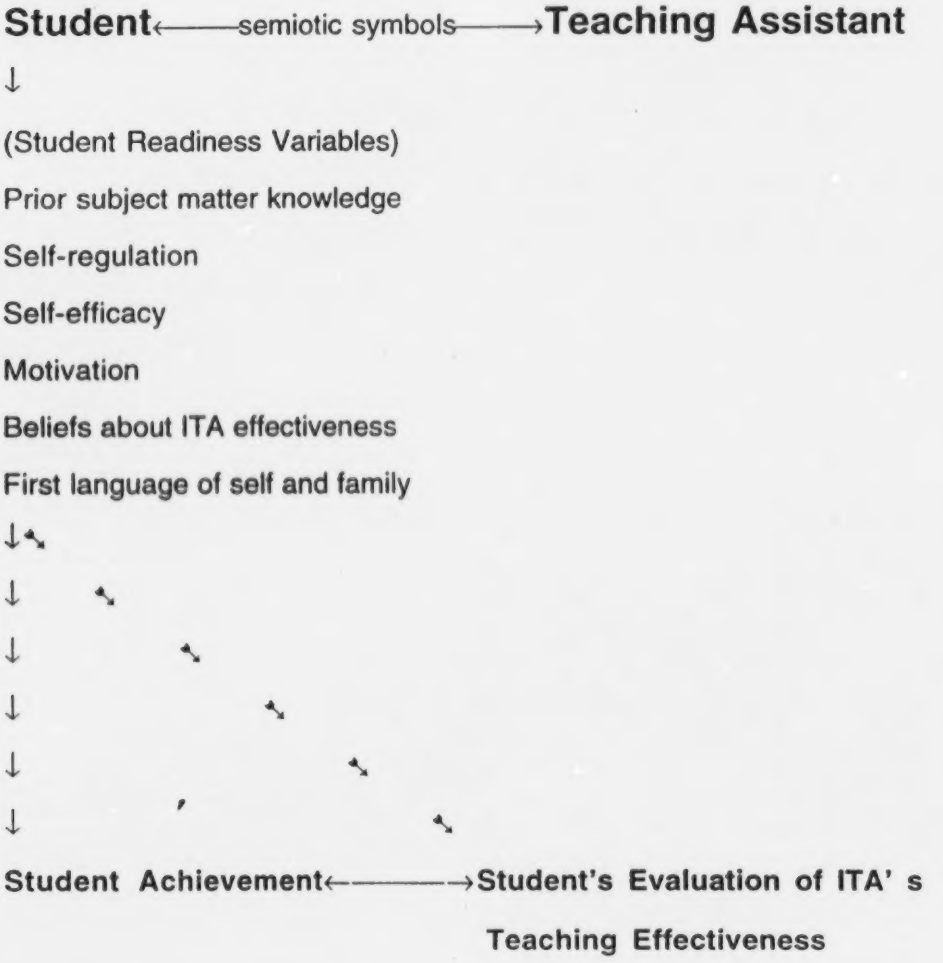

Figure 1. Student Mediation Model.

The model builds on Snow's (1992) learning readiness research. The learning readiness construct helps to understand the learner's starting state. The learner's starting state = (the learner's prior subject matter knowledge) X (the learner's self regulation skills for studying this domain) X (the learner's self-efficacy beliefs concerning the domain) X (the learner's motivation to do well in the class) X (the learner's beliefs about ITA effectiveness) X (the first language of the learner and his/her family). The readiness variables are related such that the learner must possess at least a threshold, (not zero) in any category to be able to achieve in the class. After reaching this threshold, the variables can compensate for each other.

A Student Mediation Model was used by Knight and Waxman (1991) to explain why student variables explained more variance in student achievement than teacher behavior measures. This model can be used to explore how undergraduates learn in real classrooms thereby enhancing the ecological validity of research using this framework. The student mediation model recognizes that each student arrives with a combination of prior knowledge, skills, goals, and beliefs, all of which will have an effect on the students' achievement and his/her joint construction of meaning with his/her ITA. In contrast to prior research about undergraduates taught by ITAs, this study investigates teaching effectiveness as a relational attribute rather than an ITA attribute (Civikly, 1992).

Related Literature Concerning Student Variables

Prior Subject Matter Knowledge Students with a high degree of prior subject matter knowledge may be able to construct meaning from less fluent and complete explanations (Alexander, Schallert, and Hare, 1991; Anderson & Pearson, 1984; Pintrich, Marx, and Boyle, 1993; Walker, 1987). Their subject matter knowledge will be organized in the generally accepted manner of the discipline. They may be able to predict the terminology likely to be used in explanations by ITAs. Consequently, students enrolled in more advanced courses in a domain will have more prior subject matter knowledge and perhaps have the ability to adapt to ITAs' communicative and teaching styles.

Self-Regulation Self-regulation refers to learners' ability to monitor their own progress toward their academic goals. Highly self-regulated learners have mastered good time management. They organize their activities, practice, and study time to meet exam and assignment demands. Highly self-regulated learners deliberately listen to and seek out teacher input in order to achieve their academic goals. They are likely to ask for teachers' assistance and to keep asking for assistance until they perceive that they have mastered the material (Zimmerman, 1994). In sum, if students are sufficiently self-regulating, they accurately perceive the nature of academic goals, as well as what actions are required for them to achieve their goals. Students who are enrolled in more advanced courses in a domain are likely to have higher self-regulation skills than novices in that domain.

Motivation Paris & Winnograd (1990) found that students not only regulate their strategies including predicting, skimming, summarizing, organizing, and practicing, but that students also regulate their affect and motivation. Pintrich, Marx, and Boyle (1993) suggest that students choice of a task, level of engagement in the task and willingness to persist in a task have an effect on their achievement.

For students who have decided to major in math or computer science, as a group, these students desire to get at least a C in these courses either for instrumental or integrative purposes. As a group, one can assume that all of the students want to maintain at least a 2.5 grade point average to remain eligible for degrees in their majors.

Self-Efficacy "There is empirical evidence that more affectively charged motivational beliefs such as students' self-efficacy beliefs and their goals for learning can influence their cognitive engagement in an academic task" (Pintrich, Marx, and Boyle, 1993, p.172). "Self-efficacy beliefs have been defined as individuals' beliefs about their performance capabilities in a particular domain" (p.185).

Students' beliefs about their ability to succeed is inextricably tied to their perception of intelligence. When students perceive intelligence as changeable, they tend to have a mastery orientation toward learning (Dweck & Leggett, 1988). Students with mastery orientations toward learning believe that academic achievement is contingent on effort as

opposed to ability. Consequently, students with mastery orientations are likely to persevere to achieve their goals. Conversely, those students who believe that achievement is contingent on fixed abilities tend to give up especially when they perceive that the task may be difficult or beyond their fixed ability. Schunk (1991) conducted experimental studies that revealed that improving self-efficacy beliefs leads to higher math achievement. Likewise, Pintrich & Garcia, (1991) found that undergraduates' self efficacy beliefs about their performance was closely related to their academic grades.

Beliefs About ITA Effectiveness If undergraduates have negative preconceptions about their ITAs' ability to provide them with the level of support and challenge that they need to master their academic goals, they may be unwilling to attend ITAs' discussion sessions, lab sections or to seek individual instruction. Equally important, if the undergraduates feel that they are powerless to improve communication between ITAs and themselves, they may also minimize contact with ITAs, and maintain more negative evaluations of ITA effectiveness.

In addition, where the students' initial expectations that their TA would be a native English-speaker is not met, they might feel deprived of what they believed they were entitled to resulting in more negative evaluations and affect concerning their ITA. However, where students have regular contact with a specific ITA, it is likely that their prior beliefs

will have little impact on the students' achievement or evaluation of the ITA.

First Language of Self and Parents Where undergraduates have limited experience interacting with nonnative English-speakers, they might have to expend additional cognitive effort to construct meaning from the ITAs speech stream. In addition, they might underestimate their comprehension or ability to obtain clarification (Chang, 1993). By contrast, those students who are nonnative English-speakers or have parents who are nonnative English speakers may have developed effective strategies for improving the quality of communication.

In sum, to study the effects on student achievement and student satisfaction with ITA instruction using a constructivist model requires consideration of a complete set of learner readiness variables. At the same time, given specific contexts, one can use the model to try to understand and even predict student achievement and satisfaction with ITA instruction.

Hypotheses

1. The grades of students with adequate prior subject matter knowledge, self-regulation skills for the domain, self-efficacy beliefs, and motivation will not be significantly different if taught by nonnative English-

speaking teaching assistants (ITAs) or native English-speaking teaching assistants (NTAs).

2. The undergraduates enrolled in beginning calculus and computer science courses will evaluate NTAs significantly higher than ITAs.

3. The undergraduates enrolled in more advanced calculus courses will not evaluate ITAs and NTAs significantly differently.

Method

Sample

The grade distributions and TA evaluations for the first semester calculus and computer science courses and the second semester calculus courses in the 1993-1994 academic year at the University of Texas were chosen for this study for five reasons. First, contact with the TA in these classes was extensive, but grades were determined by the supervising professor. In both the computer science and calculus courses, the students attended a lecture with the professor for three hours per week, and attended discussion sessions led by the TA for two hours per week.

Second, both the calculus and computer science classes required minimum scores on math placement tests or successful completion of prerequisite courses. This factor helped to assure a threshold of prior subject matter knowledge and self-regulation skills in the domain. Further, the students' SAT math scores were analyzed to verify that the

students' prior math knowledge was not significantly different across ITA and NTA sections. 61.8% of the students were Caucasian. 14.5% of the students were Asian American. 15.2% were Hispanic, and 3.4% were Foreign.

Third, both the calculus and computer science classes were staffed with sufficient numbers of NTAs and ITAs to provide a sufficient sample for comparison. All of the ITAs' had passed oral English proficiency requirements prior to being appointed to teaching positions Fourth, all of these classes were integral to the students' academic careers. The students were very motivated to succeed because they were required courses for the students' majors. Furthermore, the students needed to maintain a high grade point average in these classes to maintain enrollment in their majors.

Finally, the way students were placed into discussion sections achieved pseudo randomization. Students registered for a discussion session based on their schedule. The ITAs and NTAs were assigned to teach the sections based on their class schedules. Consequently, none of the students knew who their TA would be until they attended their first discussion session. Moreover, the students had no advanced knowledge of whether their TA would be a native or nonnative English-speaker.

In this study, 36 ITAs teaching 114 sections comprised of 3,895 students, and 32 NTAs teaching 104 sections comprised of 3,560 students from the 1993-1994 academic year were analyzed. The beginning courses sample is described in Table 1. The sample studied in the more advanced courses is described in Table 2.

Table 1.
Beginning Courses Sample Description

Course	ITA	NTA
Computer Science I		
TAs	7	4
Sections	13	8
Mean SAT(Math) of Students Receiving Grades	626	614 ns ($p<.05$)
Students Receiving Grades	483	321
Students Completing TA Evaluations	147	168
First Semester Calculus for Business/Economics		
TAs	7	5
Sections	21	15
Mean SAT(Math) of Students Receiving Grades	594	578 ns ($p<.05$)
Students Receiving Grades	680	489
Students Completing TA Evaluations	229	196
First Semester Calculus for Science/Engineering		
TAs	8	13
Sections	27	33
Mean SAT(Math) of Students Receiving Grades	600	606 ns ($p<.05$)
Students Receiving Grades	906	1540
Students Completing TA Evaluations	298	572
Totals for Beginning Courses		
TAs	22	22
Sections	61	56
Mean SAT(Math) of Students Receiving Grades	605	600 ns ($p<.05$)
Students Receiving Grades	2069	2350
Students Completing TA Evaluations	674	936

Table 2.
More Advanced Courses Sample Description

Course	ITA	NTA	
Second Semester Calculus for Business/Economics			
TAs	8	5	
Sections	23	15	
Mean SAT(Math) of Students Receiving Grades	601	600	ns (p<.05)
Students Receiving Grades	648	409	
Students Completing TA Evaluations	292	128	
Second Semester Calculus for Science/Engineering			
TAs	10	8	
Sections	30	24	
Mean SAT(Math) of Students Receiving Grades	647	626	ns (p<.05)
Students Receiving Grades	1178	801	
Students Completing TA Evaluations	416	354	
Totals for More Advanced Courses			
TAs	18	13	
Sections	53	39	
Mean SAT(Math) of Students Receiving Grades	624	613	ns (p<.05)
Students Receiving Grades	1826	1210	
Students Completing TA Evaluations	708	482	

Procedure

The students' grades and TA evaluations were gathered from archival sources. The grades were obtained from the Office of Institutional Studies. The TA evaluations were gathered pursuant to ordinary university policy during the last few days of the class before final exam week. The evaluation results were obtained from the Measurement and Evaluation Center and are available campus-wide to all current students and faculty.

Results

The students' mean SAT math scores across ITA and NTA sections did not differ significantly.

The proportion of students who received no grade either due to transferring sections or dropping the course across ITA and NTA sections did not differ significantly for the beginning courses. In sections taught by NTAs and ITAs, nine percent of the registered students dropped the course. In the advanced courses, a greater proportion, 10.83% of the students in the NTA sections dropped the class whereas only 8.65% of the students dropped the ITA sections. Thus, there is no evidence that the grade distributions were inflated in ITA sections because of dissatisfied students dropping in greater proportions than in NTA sections.

Table 3 presents the mean scores for student grades and TA evaluations. As presented in Table 4, in both beginning courses and more advanced courses there was no significant difference in students'

mean grades between sections taught by ITAs and NTAs. In like manner, the students' evaluations of their TAs' communication and overall effectiveness was not significantly different for the more advanced courses. In stark contrast, the students' evaluations of their TAs' communication and overall effectiveness was significantly higher for NTAs than ITAs in the beginning courses.

Figures 1 and 2 graphically depict how in the beginning courses the students' achievement is not significantly different, but that they evaluated the ITAs significantly lower both on communication and overall instructor effectiveness. As shown in Table 6 and Table 7, TA type explains 22.1% of the variance in the communication ratings and 14.9% of the variance in overall instructor ratings in the beginning courses.

Figure 3 and Figure 4 reveal that the students' evaluations of their TAs' communicative effectiveness closely resemble their overall instructor ratings. The overall ratings tend to be a bit higher than the communication ratings.

In the more advanced courses, there is no significant difference in students' mean grades, yet as Figure 4 and Table 8 reveal, there is a significant difference in the distributions of grades across ITA and NTA sections. A larger proportion of students in ITA sections received A's. A smaller proportion of students in ITA sections received D's.

In contrast to the beginning courses, in the more advanced courses Figures 5 and 6 and Tables 9 and 10 illustrate that there was no

significant difference in NTAs' and ITAs' communication or overall ratings.

The communication ratings and overall instructor ratings are very similar with the overall instructor ratings being slightly higher than the communication ratings.

Table 3

Mean scores for students' evaluations of TAs and students' grades

		ITA			NTA		
		Instructor's Communication Rating*	Instructor's Overall Rating*	Student Grades**	Instructor's Communication Rating*	Instructor's Overall Rating*	Student Grades**
Beginning Courses	Mean	3.55	3.78	2.33	4.03	4.08	2.26
	s.d.	1.09	1.01	1.37	.99	.96	1.38
More Advanced Courses	Mean	4.00	4.08	2.45	3.96	4.01	2.39
	s.d.	.95	.86	1.33	.98	.86	1.29

*1=Very Unsatisfactory 2=Unsatisfactory 3=Satisfactory 4= Very Good 5=Excellent

**F=0 D=1 C=2 B=3 A=4

Table 4

T-tests for equality of means for students' evaluations of ITAs and NTAs and students' grades

		Instructor's Communication Rating	Instructor's Overall Rating	Student Grades
Beginning Courses	t	8.93 (p<.000)	5.97 (p<.000)	1.87 (p<.06ns)
	eta	.221	.149	.028
More Advanced Courses	t	.77 (p<.44ns)	1.47 (p<.143ns)	1.21 (p<.23ns)
	eta	.022	.043	.022

Figure 1 Students' grades for beginning courses

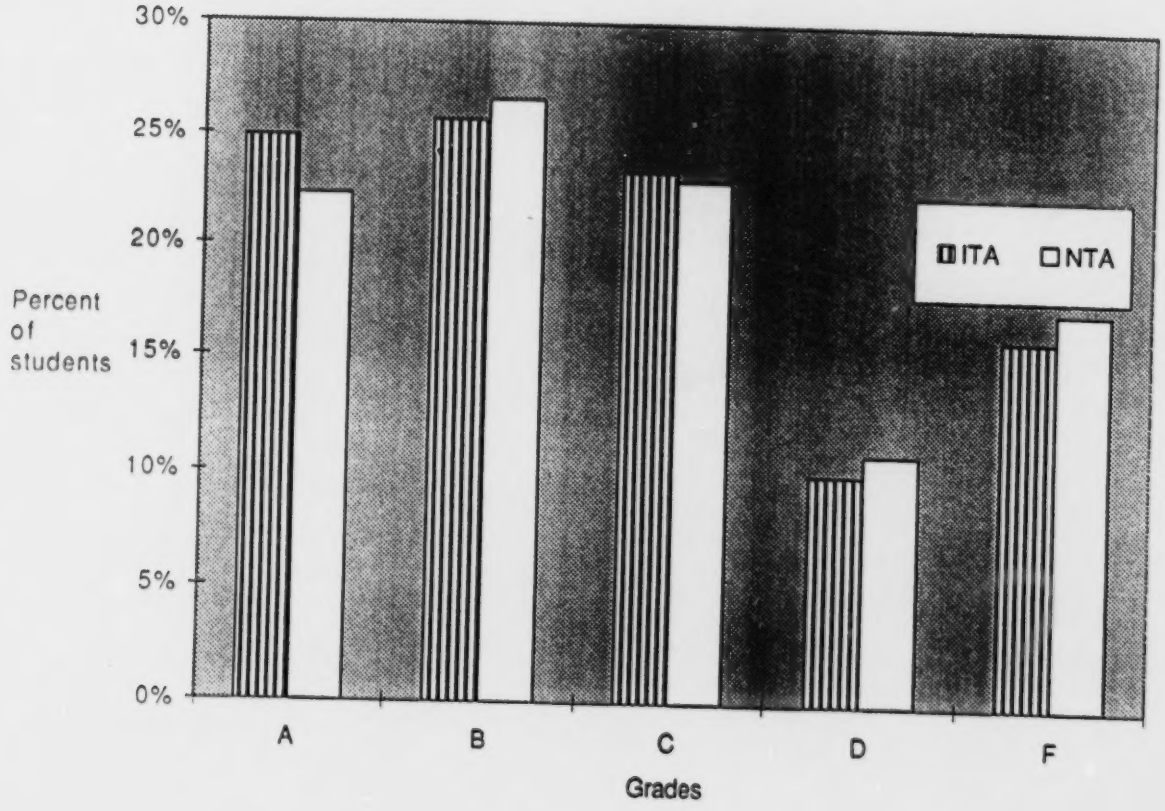

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Figure 2. TAs' communication ratings for beginning courses

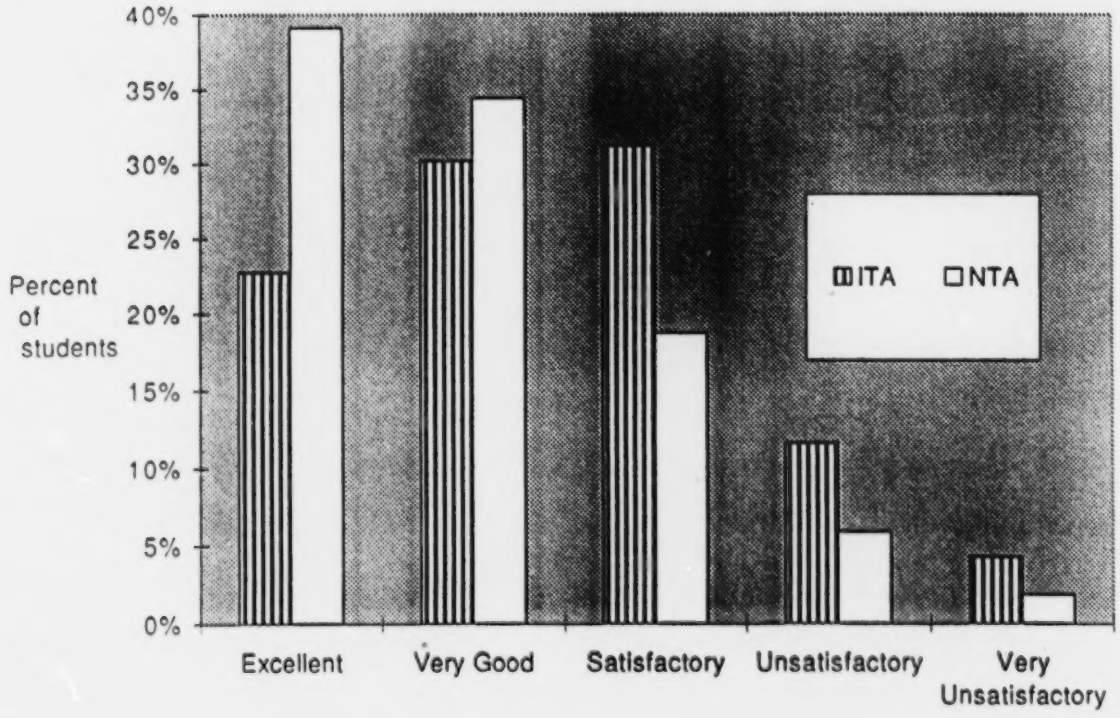

Figure 3. TAs' overall ratings for beginning courses

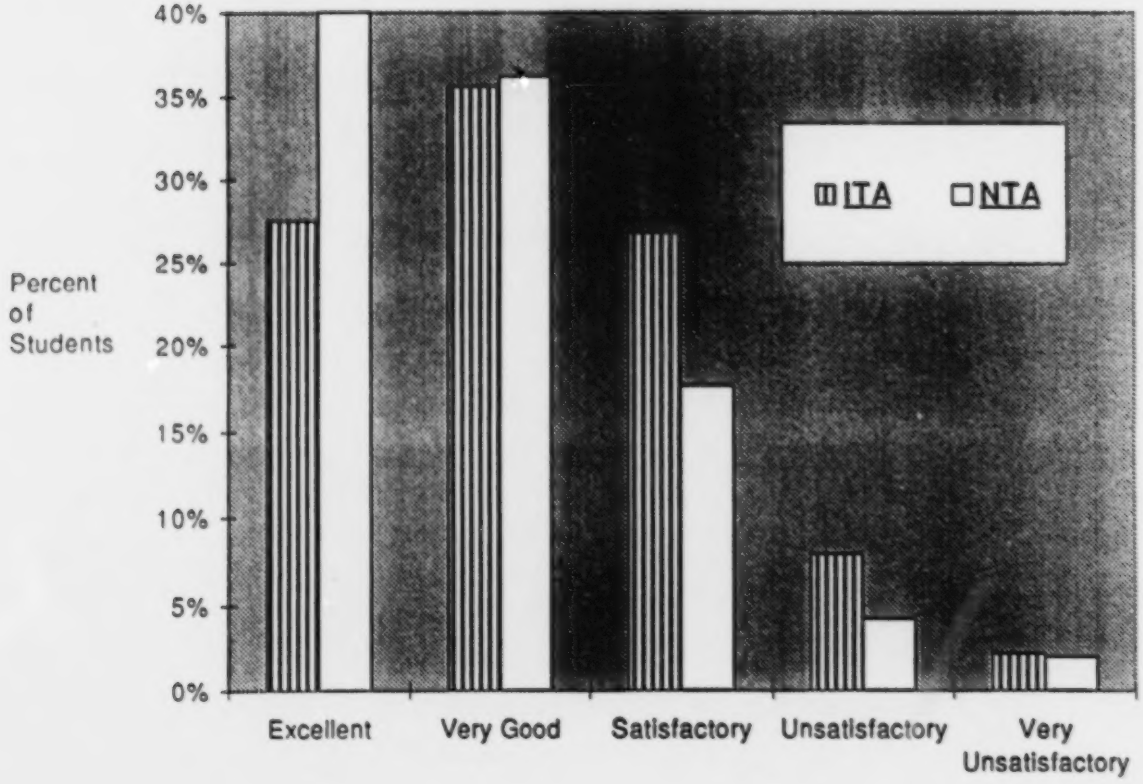

Table 5

Distribution of students' grades in beginning courses

	A	B	C	D	F	Contingency Coefficient	eta
ITA	24.9%	25.7%	23.4%	10.0%	16.0%		
NTA	22.3%	26.6%	23.0%	10.9%	17.3%		
						.035 (p<.24ns)	.028

Table 6

Distribution of TAs' communication ratings in beginning courses

	Excellent	Very Good	Satisfactory	Unsatisfactory	Very Unsatisfactory	Contingency Coefficient	eta
ITA	22.7%	30.2%	31.2%	11.6%	4.3%		
NTA	39.1%	34.4%	18.7%	5.9%	1.9%		
						.222 (p<.000)	.221

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Table 7

Distribution of TAs' overall ratings in beginning courses

	Excellent	Very Good	Satisfactory	Unsatisfactory	Very Unsatisfactory	Contingency Coefficient	eta
ITA	27.5%	35.6%	26.8%	7.9%	2.2%		
NTA	40.0%	36.2%	17.6%	4.2%	2.0%		
						.16 (p<.000)	.149

Figure 4. Students' grades in more advanced courses

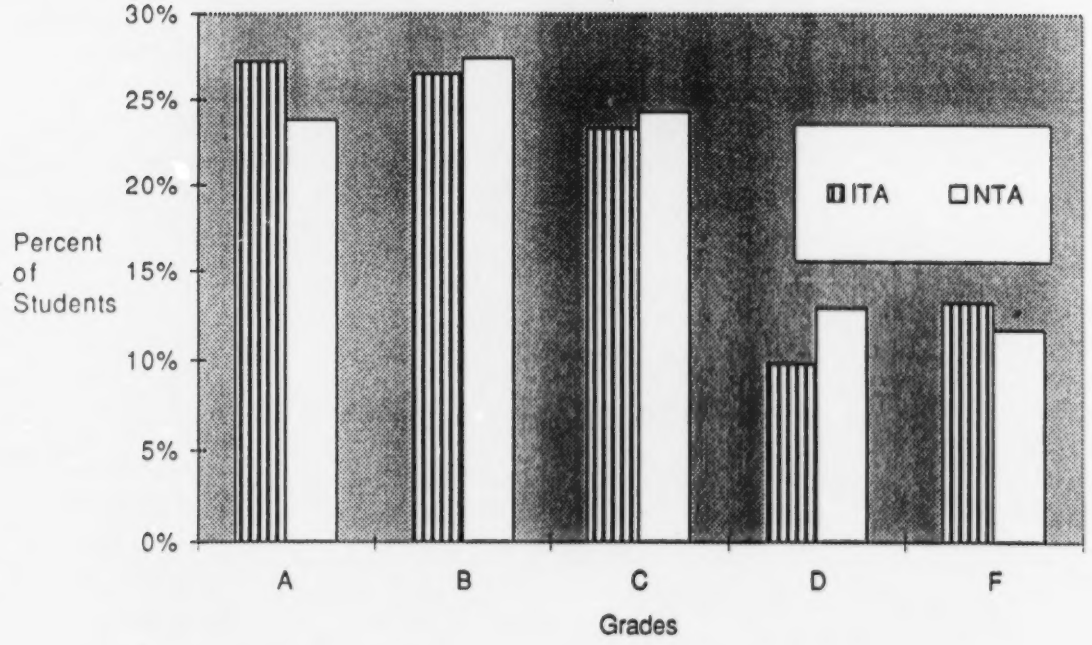

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Figure 5. TAs' communication ratings in more advanced courses

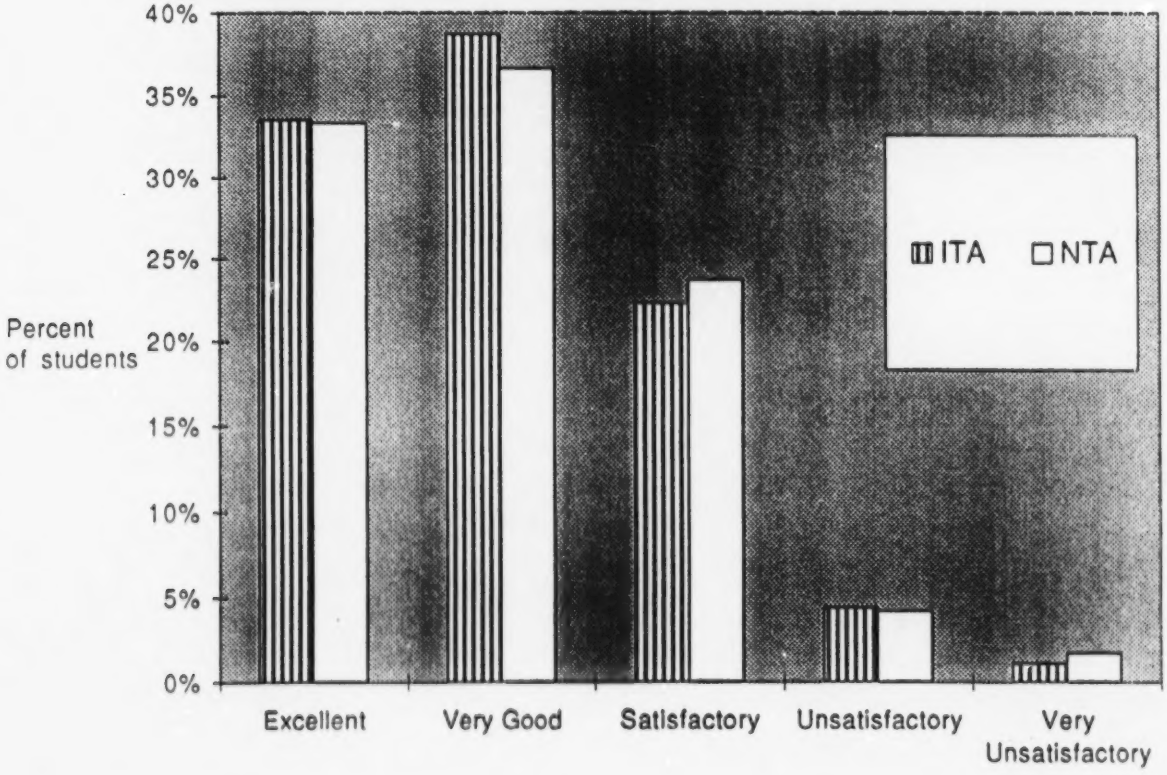

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Figure 6. TAs' overall ratings in more advanced courses

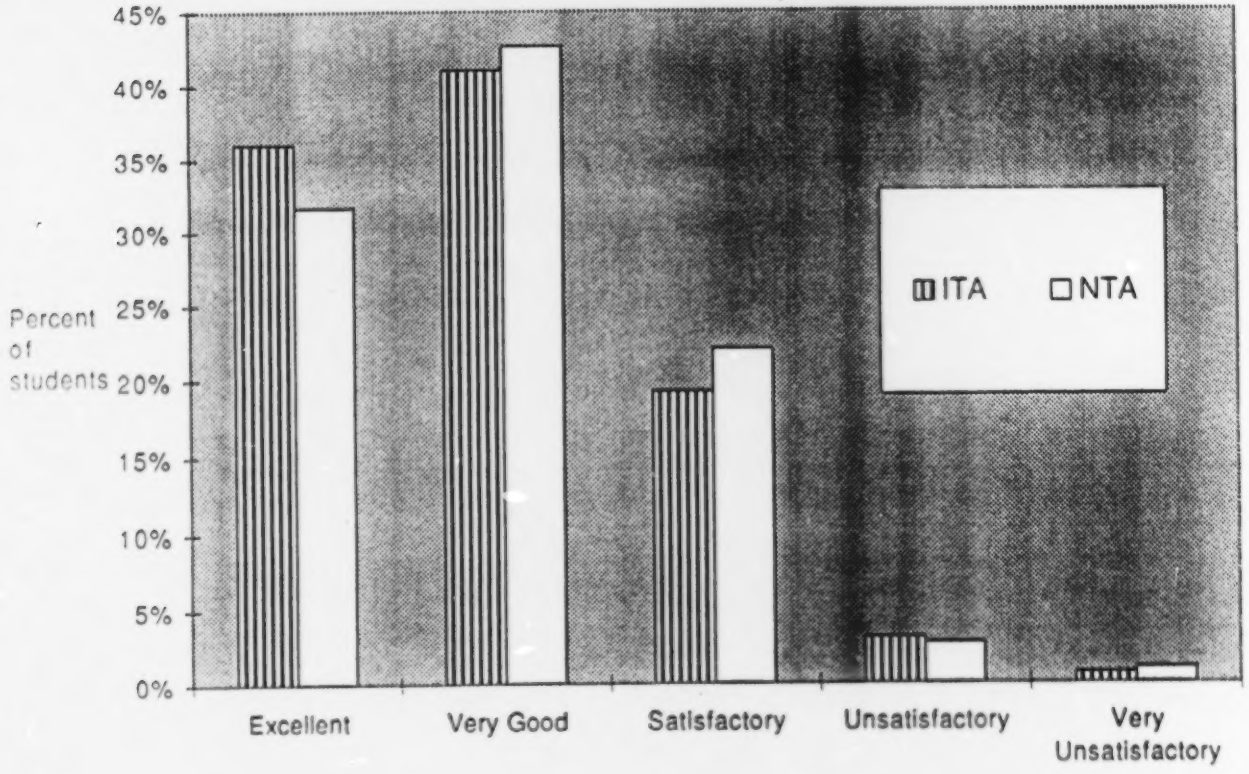

Table 8

Distribution of students' grades in more advanced courses (n=3036)

	A	B	C	D	F	Contingency Coefficient	eta
ITA	27.2%	26.5%	23.3%	9.8%	13.2%		
NTA	23.8%	27.4%	24.3%	12.9%	11.7%		
						.06 (p<.02)	.022

Table 9

Distribution of TAs' communication ratings in more advanced courses

	Excellent	Very Good	Satisfactory	Unsatisfactory	Very Unsatisfactory	Contingency Coefficient	eta
ITA	33.5%	38.7%	22.3%	4.4%	1.1%		
NTA	33.3%	36.6%	23.7%	4.2%	1.7%		
						.03 (p<.86ns)	.021

Table 10

Distribution of TAs' overall ratings in more advanced courses

	Excellent	Very Good	Satisfactory	Unsatisfactory	Very Unsatisfactory	Contingency Coefficient	eta
ITA	36.0%	41.0%	19.2%	3.1%	0.7%		
NTA	31.6%	42.6%	22.0%	2.7%	1.0%		
						.05 (p<.48ns)	.04

Discussion

The sample in this study was specifically chosen to represent undergraduates who were adequately prepared to study calculus or computer science. All passed prerequisite courses or placement exams that indicated at least a threshold level of prior subject matter knowledge, self-regulation skills for the domain, and self-efficacy beliefs. Their Enrollment in these required courses for their majors confirmed that the students had a threshold level of motivation to succeed in the classes. Given this level of student readiness, pursuant to the Student Mediation Model, it was hypothesized that these students' grades would not be significantly different whether they were in an ITA or NTA section. This hypothesis was confirmed.

The students' grades were not presumed to be a measure of the students' satisfaction with the TAs' performance. Instead, it was hypothesized that undergraduates enrolled in the beginning calculus and computer science courses would evaluate the ITAs significantly lower than the NTAs. The Student Mediation Model illustrates that when one doesn't have a high degree of prior subject matter knowledge, one may lack enough familiarity with the symbol system and conceptual organization to successfully negotiate meaning with an instructor who uses the terminology of the domain rather than layperson speech.

Beginning students might need more explicit, elaborate, and easy to decipher explanations in order to acquire and build their knowledge networks in conformance with the target domain. The Negative Affect

Mechanism Model (Sebastian & Ryan, 1985) suggests that when listeners have to use more cognitive resources to negotiate meaning, they experience negative affect and evaluate the speaker more negatively. In this context where undergraduates were new to the discourse patterns and symbol systems of a domain, they may have lacked the cognitive capacity (Sweller & Chandler, 1991) to acquire new concepts and construct meaning with ITAs who used domain specific discourse patterns.

The Student Mediation Model is also helpful for explaining why the more advanced students evaluated the ITAs on a par with the NTAs. In the more advanced classes, the students had more subject matter prior knowledge, self-regulation skills, and self efficacy beliefs allowing them to structure their interactions with the ITAs to their satisfaction. Once the undergraduates had sufficient domain knowledge and skills, they shared a symbol system with their ITAs and evaluated the ITAs' communication skills and overall teaching effectiveness on a par with the NTAs.

The Student Mediation Model helps to explain why ITAs who were certified as proficient in oral English and who taught classes where their students achieved on a par with students in NTA sections might be perceived as less effective teachers by students, parents, or other novices in the domain. The Student Mediation Model highlights the role of the learner's readiness to construct meaning in the domain. The results of this study support that dissatisfaction with ITAs may not be the

result of social stereotyping, but a lack of learner readiness in introductory domain classes.

Conclusion

From the data, one can conclude that students taught by ITAs in more advanced classes adapt to the quality of instruction. The students' grades and evaluations of their TAs are not significantly different across NTA and ITA sections.

Conversely, students in beginning courses appear to lack sufficient readiness to negotiate meaning with ITAs resulting in lower communication and overall ratings of ITAs in comparison to NTA ratings. Despite the beginning students' lower level of satisfaction with ITA teaching effectiveness, they are able to marshall their efforts in order to achieve on a par with students in NTA sections.

The implications of this study is that contrary to common practice, university administrators should try to avoid assigning ITAs to beginning courses. Instead, ITAs should be assigned to more advanced classes where the students have sufficient prior knowledge including the discourse style and symbol system of the domain to jointly construct meaning with ITAs.

In sum, by using a Student Mediation Model in lieu of an Information Transmission Model, researchers and administrators may be in a better position to explore how undergraduates learn from ITAs as well as facilitating student achievement and student satisfaction with ITA teaching effectiveness.

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